

## OPENING REMARKS

Mr. James E. Webb, Administrator  
Future Applications Conference  
February 9, 1962

I made a statement last night to Earl Stevenson that the face of the modern space man was not John Glenn, but Hugh Dryden. Although John is risking his life in the craft that actually performs the experimental flights which are essential to prove out our theories of man's orbital flight, it is the program represented by Dr. Dryden and those who have been associated with him for a long time, that really makes the flight possible. This is the group that conceived the steps leading up to the flight and the program framework which will enable the United States to proceed to more advanced programs which lead on from this particular flight, and which will capitalize, from an application's standpoint, on the scientific research associated with it.

The agency (NACA) which preceded this organization, was almost altogether a research and service organization -- devoted to research and development and to experimentation on equipment that had proved in service to need further refinement. An example of the latter would be a commercial airplane, like the Electra, that required some additional perfection. However, the Agency's products were all used by somebody else, not by this agency. Then, in 1958, when the agency was projected more vigorously into the space business than before, it became an operating space agency, which meant it had to begin to use its own research. The agency itself had to conduct experimental programs that would be useful in proving the validity of its conceptions, its doctrine, its policies, and its programs. In a sense, this is quite a different kind of

of a problem for organization, for management, for self-evaluation, for incremental improvement of programs.

The point I want to make is that this organization, created in 1958, is an operating agency in space, but continues also as a research and development agency in the field of aeronautics, having a very broad legislative charter. This charter requires it to operate space vehicles, to conduct the kind of research which will permit the nation to move forward in all the science and technology needed to: (1) fully develop space for military purposes; (2) yield the knowledge of the universe which we need to refine further the actual structure of science on which our theoretical and practical work is done; and (3) further refine the use of this scientific structure throughout a growing economy that produces a gross national product somewhere between five and six hundred billion dollars. In addition, this provides that the agency, I think partly in justification of the large scope of the program and the enlargement of it, must apply the knowledge gained "for the benefit of all mankind."

This agency must consult the scientific community in developing its program and it must report to the scientific community on its activities and the results thereof. Beyond that, it must report to the general public, and there's a neat question as to whether this requirement was meant to encompass the readers of the daily newspaper who might have an interest in the program — all those people who were most interested in applications such as the industrialists of the nation who operate within the private enterprise system that has made this country such a strong and vigorous nation in the world.

But all of this, from the limited experience I've had with it in the last year, means that we have a very broad charter. The legislative history doesn't point precisely to the way these things should develop. Rather, we have the opportunity to enlarge this charter in any area that is really useful to the country. Now, this is a pretty broad statement for an administrator of a Federal agency to make in a Government that is presumably a Government of laws and not of men, but if you read this law, you find in it, I think, a great deal of what I have just said to you. Namely, an opportunity for those of us who have a research responsibility, and an operational responsibility, to also develop in this area of applications a means by which that tremendous power developed since World War II through large scale organized efforts in science and technology can be used for the national good.

I remember very well in the Bureau of the Budget about 1947 or 1948, when very little was known about what the Federal Government was doing in science and technology, it was suggested that the Bureau pull together and list in one section of the budget all these activities that the Federal Government was engaged in, whether in Agriculture, Bureau of Standards, Defense, or elsewhere. We did this, and the amount was something under two billion dollars at that time (a billion eight, if I recall the figure correctly). Since that time, the effort has multiplied about ten-fold.

The National Science Foundation recently has estimated that the national level for 1963 will be about eighteen billion dollars; this includes government, universities and industries. We are right in the forefront of this effort, partly because our work is not classified to

the extent that AEC is or the Defense Department is. Therefore, with this fairly broad charter to plan our program in consultation with the scientific community, to report on the program to the general public, and to apply it through communication satellites, weather satellites, navigational satellites, and whatever else comes out of this program for the benefit of all mankind, we have a rather unique opportunity.

Well, to return to the idea that we are experimentalists, I think that what Mort Stoller has in mind is that through a consideration of the opportunities that are opening to us, we may begin to settle on some sound concepts on how we may organize our activity in this area, beyond the specific things, such as the communication satellite; how we may examine the results of the efforts that we do organize and put in motion; and how we may experiment, if you will, with the means by which the country can get the collateral benefits.

Last night when Hugh and I were talking with Earl Stevenson, I mentioned the restaurant in New Orleans that has a sign over the door that reads, "We have gravy and other things". Well, gravy is a right important thing in the South. Space is important in this agency, but space is not the only important thing. In many ways the nation will support very large efforts in science and technology for the specific purpose such as we have here, and for long range purposes such as understanding the universe in which we live, only if there are the kind of collateral benefits flowing from the program that are inherent in the program.

I think the image of a program that is conducted upon cloud A for the benefit of the scientific community and costs five billion dollars a year has less survival value in a democracy, where everybody has the vote, than one that says, "This is an important objective; we are doing it for these reasons; we are supporting the military establishments with what they need, but also there are many collateral benefits." In fact, if we could be able to say to the public, "You are going to get back from this program \$2 for every \$1 spent, and go to the moon and understand the universe in addition," I think you would have a program with a great deal of survival value. Maybe that is too big an objective. Maybe what we have to do is set a more modest one by saying we expect to get a dollars' worth of specific identifiable applications for every dollar spent in the program and do the program in addition, for the other benefits that are in it. I don't know.

I'd like to have you, though, set your sights very high, because in all these endeavors if you set your sights at 125 percent of what you think is possible, than you've got a better chance to get up near 100 percent. I hope in this meeting, you will not set your sights low in the area of applications.

If you look back to the kind of decisions that were made when the Atomic Energy Commission was established, you find this: A debate was had; the agency was established; it wasn't connected with the Defense Department; it had to hold all efficacious materials, it had to hold all patents. It still had this flavor of getting something out of the program for the general benefit. Many things have come out of the program

for the general benefit, not the least of which are improvements in the educational structure, and in the number of engineers, scientists, and technicians in the country who know how to work with atomic energy.

The Science Foundation was established in 1950, and the Space Administration in 1958 — a much broader type of legislation that created an operating agency rather than a granting agency like the Science Foundation. Then, in 1961, after another national debate, the Arms Control and Disarmament Agency was established — patterned very largely on the evolution of thinking about how to use science and technology for major areas of objectives that the United States has. So here is a developing pattern of which we are a part.

Again now, turning from that type of thinking about our program to the actual situation in the country, it has seemed to me that as large-scale organized efforts have developed in the area of science and technology in conjunction with the educational institutions of the country, we have had a quite strong concentration in the northeast, a growing concentration on the west coast, some centers like Chicago, and a few smaller centers like Michigan and Minnesota. But by and large, that vast region of the interior of the country that stretches from Canada down to Texas and a couple of hundred of miles east of the Mississippi on out to the Rocky Mountains has not found a way to keep pace with the most advanced developments in this field.

Now, what does this mean? It means that, as the rate of change increases, there comes a widening gap between institutions like Cal. Tech. and M.I.T. and those, let us say, at Lawrence, Kansas or Stillwater,

Oklahoma. Now, I think one of the real great challenges of our time is how, without slowing down the best institutions we have, in which so much of our science and technology is based, to get a transfer into a more widely dispersed area. How can we narrow the gap, not by slowing down the front-runners, but by having the others move up, taking advantage of the things that have been learned in other places? Now, this is not a simple thing by any matter of means, but if this agency is to accomplish the very large program ahead of us, and to do it without doing damage to other going programs where the same types of men and brains are required, we must increase the total resources of the country. So we are, I think, in our space science area, to some extent in the applications area, to some extent in the area of research and advanced technology, endeavoring to so handle our program in research and education — marrying the two so as to encourage the efforts of these institutions broadly dispersed throughout the country who want to, by their own efforts, try to narrow the gap by speeding up, rather than to let the gap widen by seeing their ablest people constantly drained off into the strongest centers of research.

It seems to me that this is important to the applications program because if the applications program of this agency is to be effective broadly throughout the country, there must be interdisciplinary centers of able people who can understand the work we are doing in energy, in new materials, in metals, in lubricants, in fabrics, in very advanced electronics and communication, in the life sciences, and in the systems management concepts which we use to tie the whole thing together. Now, as these interdisciplinary groups are formed, you have to ask yourself,

how will they survive, within what flavor and context will they operate? And if you look at the kind of institutional attachments that are available — that have survival value, that have persisted — you do not find very many of them.

As a matter of fact, there are in this country many fewer corporations than you might think which have a life span of over fifty years. The church is a continuing institution; Government is a continuing institution; the universities are continuing institutions. They do have a widening of disciplinary flavor. You've had a long development of technical institutions such as our agricultural and mechanical colleges. You've had relationships between them and the constituency that they support, such as the agricultural industry; even the A & M institutions have courses in retailing. There has been an evolution to meet the needs in the specific areas in which they live.

Now, I think as we see these broad reaches of a national market build the power that results in a GNP of five hundred and forty billion dollars and we see giant corporations emerge, we still see that even these giant corporations do not operate comprehensively over a broad geographic region. They have to be concerned with their specific purpose, their specialty, the sale of their product, the profit-loss sheet at the end of the month. To over-simplify it, you would say that northeast Illinois is a large area; they expect an additional four million people in the next ten years as urbanization takes place. The president of Sears Roebuck, Inc. or the Illinois Central Railroad cannot really take the time nor spend the money of his company to understand all the



forces that work in northeast Illinois which is his headquarters — the place where he has to operate from. But the universities there, Northwestern, Chicago, Illinois, can understand this region. They have historians, space scientists, economists, political scientists, advanced legal schools.

The point I want to make is that in the applications field, it seems to me, the nation will benefit if there is an interdisciplinary flexing of opinion as to what a national expenditure of eighteen or so billion dollars a year in advance science and technology really means to an area like northeast Illinois — or to the four and a half states that Ed Buryan is working with up around Minnesota. Now, it seems to me that in planning our applications' work, we must have a few anchor points around the country which can become, you might say, pilot models for how the thing might be done. Using an experimental approach, you produce a pilot model that may not work perfectly, but if it works, than you've got a chance to improve it and make it work more perfectly.

I do not think, of course, that we can suddenly evolve some kind of a nation-wide theory or concept and write it down on the blackboard and publish it and put it on TV and say, "By golly, this formula will solve the problems of California, New England, the Gulf of Mexico and the upper regions of the Columbia River" — I just don't think you will find this sort of thing.

Well, I'll leave that now and switch to another type of thinking that Hugh Dryden and Mort Stoller and others like Abe Silverstein have been doing; and that is the role of our Centers. We have in our

NASA Centers, a wide variety of organizations of different kinds. Each is somewhat specialized, but each has a wide diversity of disciplines; each has in it many of the types of minds that live and flourish in the universities.

I find down at Langley Field, for instance, that not only every airplane that flew in World War II flew 15 to 30 miles an hour faster because of the full-scale wind tunnel, but that the submarines used in World War II were improved in it. I find that the propellers that drive the ships made at the Newport News Shipbuilding Company have about two knots of increased performance as a result of the work done there. I find that the funnels on the ships don't throw the smoke down on the deck to annoy the passengers because of the aerodynamic work done there at Langley Field.

What I'm trying to say is that there is an area of thinking that I believe all of us should have in mind — that can exist at our Centers if we develop the kind of thinking among the people there that is sensitive to the needs of the leaders for problem solving in that area. Working with the universities in the area, we may find a regional organizing concept that involves our Centers, the educational leaders, and the business leaders of these areas. And I think that this has a very real value in that the results of theoretical work somewhat isolated from specific problems or even directed toward a national problem may be applied to the solution of regional problems.

But you can look at the transportation problem in Cleveland where we have the Lewis Center. You can relate it to the metropolitan area studies that have been conducted there. You can, down at Langley

Field, look at the relationship of the fact that we have 300 employees taking advanced degrees in the educational institutions in Virginia — the effect of this on the educational institutions in Virginia. Incidentally, we created quite a little storm down there, when we talked about putting an accelerator in one of the institutions instead of in our own backyard down at Langley Field. I guess some of you have been aware of this, but this created a tremendous upheaval in the thinking of the educational leaders of the State, because they hadn't quite planned it this way and were concerned about what the full effects of it would be.

I don't know the proper answer to this kind of question, but I don't believe that it is going to be found in Washington or California. I think it has to be found right down there on the peninsula of Virginia and one of the things that has been most interesting to me is to see that the people down there in Virginia who felt so very badly about the Space Task Group moving away, suddenly realized that they had been regarding our installation as nothing but a Government payroll on which they could feed (this is a little exaggeration but nevertheless, this is the basic kind of thing that most of them did in the Chamber of Commerce).

They now suddenly realized years of vital force that is linked to their future in industrial development and economic growth, and my golly, they found an acre of diamonds right in their own backyard. But, what are we going to do about it? Are we going to simply react to the local pressures? Are we going to try to create the kind of thinking at Langley Field that says our people are willing to participate in the solution of the problems that affect the peninsula of Virginia along with

the university people, along with the industrial and political and civic leaders of that area? I believe that if we could evolve the program we would be proud of in several years, this would be a rapid way to progress. I do not think you are going to leave this meeting here today and find that you have solved the problems and have a blueprint for the future. I'd like to conclude, though, by saying that in this organization, as it has grown, as it has adapted itself to this new operating role in addition to its research role, a rather remarkable thing has happened. We have installed a very sophisticated form of organization. A large amount of the credit for this in my opinion is due to Keith Glennan, the first administrator, who had the vision to see that we had to study the problem of how you organize the effect.

But we have now arrived at a point where we are experimenting with a very sophisticated form of organization to operate a very large program. We have some strong Centers where we have research tools. We have to think of how those Centers can not only do the job for the program today, but how they can evolve the tools needed over the next twenty-five years or so as the space program develops. Therefore, we have to have in our advanced research and technology development, the kind of thinking that faced the leadership in deciding to build full-scale wind tunnels for airplanes in 1929 or 1930, when to build a full-scale wind tunnel was quite an undertaking. It requires a lot of courage to go forward and say you are going to do this as a Government institution. But more than that, it took a lot of courage for the engineers to sit down and say, "We are going to design and build a full-scale

wind tunnels that will really work". Who is going to do that for the next twenty-five years with respect to space and this very complex area of science and technology in which we engage?

This is one of our responsibilities. We have a strength in our Centers to furnish initiative in this direction. We have an office in Washington which, at the moment, is headed by an acting director, but in which, we hope, soon to have a very advanced leader. We're bringing in, to help us in the thinking about this program, such men as Arthur Raymond, who will be here this week, and who will, I hope, become deeply engaged in the forward thinking about advanced research and technology. So, I think that this will move in a direction that will furnish spin-off.

The question is, "How do we get the spin-off? How do we get the feed-back into the economic, social, and political growth in the country?" Turning to another area in space science, I think it is a rather remarkable thing, that we have been able now to make a conversion from the time a year ago when we were somewhat on the defensive with respect to the National Academy of Sciences — the Space Science Board — brilliant men who make the speeches and write them into publications and say all the things that ought to be done about space, each one having his own ideas. Now, we have made a conversion to an organized form into which such ideas are received, to which these people come. And they come knowing that they are approaching people who understand the problems, at least as well and perhaps better and on a broader basis than the fellows on the outside.

Now, instead of the Government being on the defensive in the area of space science for not having an adequate flight program, we suddenly come to a situation where we are going to have flight vehicles for far more experiments than the scientists have yet dreamed up. This is a rather remarkable kind of conversion. Out of this is going to come a feed-back on spin-off or area of innovation that none of us can conceive in this room. But the effort is organized; it is bringing in resources from industry; it is creating new types of interdisciplinary thinking in universities. All of this is, in my opinion, a dramatic new factor if you are going to think about applications. This agency has a program of manned space flight that will involve some twenty million dollars. I suppose more goes into technology than into science, but in any event, you are going to see a very rapid, hard driving effort in the area of manned space flight, manned exploration of the universe. You are going to see why the big vehicles are being built, not like Apollo, like the Advanced Saturn, perhaps Nova, an experimental flight program with Gemini and the Titan so that the combination of a experimental X-15 type of program with all of the knowledge and skills gained from that, will be flowing in with these other factors from space science and from advanced research and technology.

Now that leaves, of course, the fourth area of applications. In every one of these four areas, we have one man as a program director. The budget goes to him; the responsibility rests on his shoulders for carrying the effort and he has in his own staff and in the ability to use the Centers, to solicit support of the Centers in his program — the ability to command a wide variety of resources throughout the United

States, and, indeed, the world, in his program. This means that these four program directors can have a flexing relationship, a rubbing of minds, a close coordination, that we have taken the basic programs and put them on the shoulders of four men. This is a very interesting way for a Government agency to drive ahead. Each of these men, in effect, is the general manager of his area. He has the man, money, materials, and organizational framework with which to get on with the work.

The problem, mainly, is how can we be wise in deciding what to do? Well, in the manned space flight program, we are bringing in not only additional assistance in the form of people on the Government payroll, but we are bringing in now the kind of thinking that, say, the Bell Telephone Laboratory group can do in the conceptualization of the problem, the analysis of the future problems we have to solve, and the international concepts.

In the advanced research field, I mentioned that we are trying to get some men like Arthur Raymond to look at the problems with great care. In the space science field, we have the Space Science Board of the National Academy of Sciences and a very close relationship with the Federal Council on Science and Technology, with quite a number of really extremely able people, not to speak of the space scientists around the country that are actively participating in the program and doing most of the space-science experimental work.

So, now you come to applications. We have here with us four consultants, who we hope will begin to add to the knowledge of what to do and some measure of how to do it too. Mr. Earl Stevenson, who came down last night, just retired as Chairman of the board of Arthur D. Little

and Company and has undertaken to give us some of his time and much of his brain, whether he is in Washington or in New England.

We have Ed Buryan who is an expert in marketing. We do have something to sell. Ed has finished a tour of duty as President of Motec Industries and before he goes off to be president of another company, we've said we don't have anybody who really knows marketing, we would like him to spend some time with the U. S. Government. He has very kindly consented to do that.

Frank Godsey is here. Here is a man with a long distinguished career in business with large organizations such as Westinghouse. He has just finished a tour of duty as president of a company that gave him an even wider area of general management experience, perhaps than Westinghouse did, who is willing to give us half of his time on this program.

We have the distinguished Dr. Williams here who has served as President of the University of Houston. Now, here is a man who sees a region of the country where the leaders have to solve many problems, not to speak of the integration problem. What can science and technology do to help the leaders of this area mobilize their resources? In a state like Mississippi, you've got terrible problems of education and yet, you've got great opportunities. In Alabama, where he comes from, and in Texas there are vast areas of opportunity.

We are going into these areas with large installations, mainly, because we have no other choice. The things are so dog-gone big that we have to move them by water, and we have to get them close enough together so that they become a manageable complex. We have only too



few competent people to manage a thing as big as this program all over the United States, and indeed, throughout the world.

So, I think those of you in the NASA organization, whether in Headquarters or in the Centers, do have an exciting opportunity to participate in something that is a further development of programs that grew out of World War II and have been amplified to meet the needs of the country. I hope that out of this conference and others that you have, will arise the answers to problems that we have to solve together. I hope each of you, when you go back to your Centers, will ask yourself how the great resources of your Center can be utilized in the kind of effort that helps the country, that helps the NASA program.

Maybe you'll find a number of your brilliant engineers and scientists who would like to see their work not only flown out in space, but have a practical application in the providing of tools for the men who will be working with the education of their own children in the local schools or building the roads on which they drive to work every day, etc. So, it seems to me that you do have an exciting and interesting opportunity and your imagination and interest and drive is what is needed.

We are not at all trying to give you a formula. We want you to develop your formula, and we'd be very happy if the one in California really worked in California and we wouldn't care if that exact formula was directly applicable in the peninsula of Virginia. We would like to see the Virginia people develop a formula exactly suited to their needs.